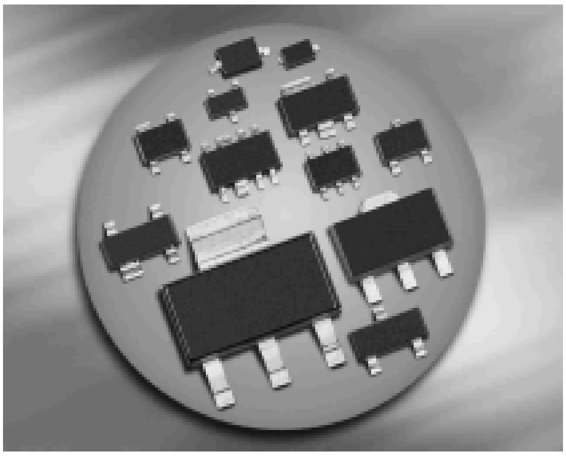
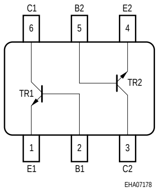
NPN Silicon Switching Transistors



- High DC current gain: 0.1 mA to 100 mA
- Low collector-emitter saturation voltage
- For SMBT3904S / SMBT3904U:
  Two (galvanic) internal isolated transistors
  with good matching in one package
- Complementary types: SMBT3906... MMBT3906
- SMBT3904S / U: For orientation in reel
  see package information below

SMBT3906S/U



Type	Marking	Pin Configuration						Package
SMBT3904/ MMBT3904	s1A	1=B	2=E	3=C	-	-	-	SOT23
SMBT3904L3*	1A	1=B	2=E	3=C	-	-	-	TSLP-3-4
SMBT3904S	s1A	1=E1	2=B1	3=C2	4=E2	5=B2	6=C1	SOT363
SMBT3904U	s1A	1=E1	2=B1	3=C2	4=E2	5=B2	6=C1	SC74

* Preliminary data

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	60	
Emitter-base voltage	V_{EBO}	6	
Collector current	I_C	200	mA
Total power dissipation-	P_{tot}		mW
$T_S \leq 69°C$		330	
$T_S \leq$ tbd°C		250	
$T_S \leq 115°C$		250	
$T_S \leq 105°C$		330	
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	**Symbol**	**Value**	**Unit**
Junction - soldering point[1]	R_{thJS}		K/W
SMBT3904/ MMBT3904		≤ 245	
SMBT3904L3		≤ tbd	
SMBT3904S		≤ 140	
SMBT3904U		≤ 135	

Electrical Characteristics at T_A = 25°C, unless otherwise specified

Parameter	**Symbol**	**Values**			**Unit**
		min.	**typ.**	**max.**	
DC Characteristics					
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	40	-	-	V
Collector-base breakdown voltage I_C = 10 µA, I_E = 0	$V_{(BR)CBO}$	60	-	-	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBO}$	6	-	-	
Collector-base cutoff current V_{CB} = 30 V, I_E = 0	I_{CBO}	-	-	50	nA
DC current gain[2]	h_{FE}				-
I_C = 100 µA, V_{CE} = 1 V		40	-	-	
I_C = 1 mA, V_{CE} = 1 V		70	-	-	
I_C = 10 mA, V_{CE} = 1 V		100	-	300	
I_C = 50 mA, V_{CE} = 1 V		60	-	-	
I_C = 100 mA, V_{CE} = 1 V		30	-	-	
Collector-emitter saturation voltage[2]	V_{CEsat}				V
I_C = 10 mA, I_B = 1 mA		-	-	0.2	
I_C = 50 mA, I_B = 5 mA		-	-	0.3	
Base emitter saturation voltage[2]	V_{BEsat}				
I_C = 10 mA, I_B = 1 mA		0.65	-	0.85	
I_C = 50 mA, I_B = 5 mA		-	-	0.95	

[1]For calculation of R_{thJA} please refer to Application Note Thermal Resistance

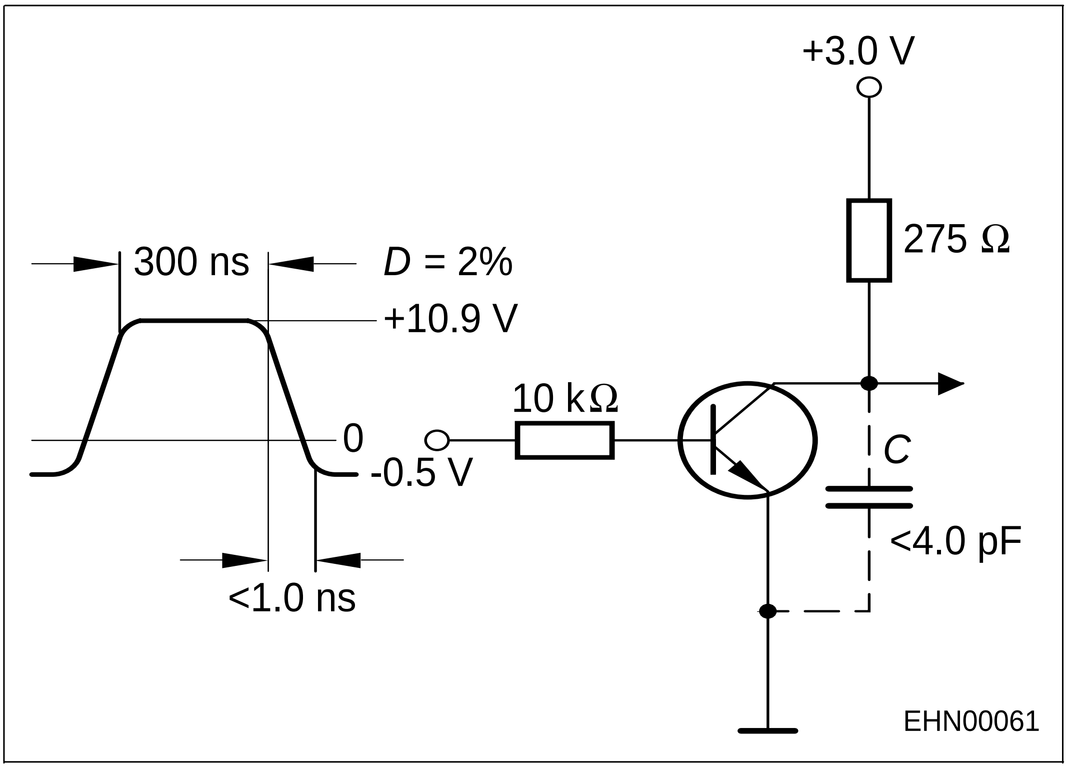
[2]Pulse test: t < 300µs; D < 2%

Electrical Characteristics at T_A = 25°C, unless otherwise specified

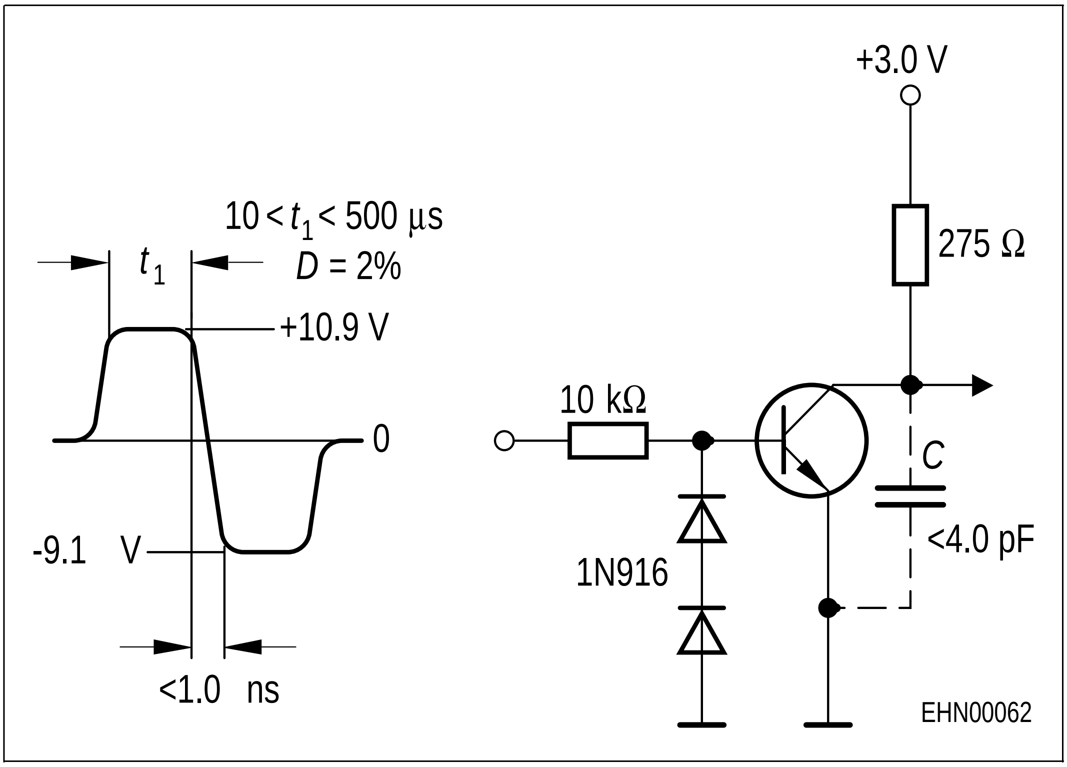
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	300	-	-	MHz
Collector-base capacitance V_{CB} = 5 V, f = 1 MHz	C_{cb}	-	-	3.5	pF
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{eb}	-	-	8	
Delay time V_{CC} = 3 V, I_C = 10 mA, I_{B1} = 1 mA, $V_{BE(off)}$ = 0.5 V	t_d	-	-	35	ns
Rise time V_{CC} = 3 V, I_C = 10 mA, I_{B1} = 1 mA, $V_{BE(off)}$ = 0.5 V	t_r	-	-	35	
Storage time V_{CC} = 3 V, I_C = 10 mA, I_{B1} = I_{B2} = 1 mA	t_{stg}	-	-	200	
Fall time V_{CC} = 3 V, I_C = 10 mA, I_{B1} = I_{B2} = 1 mA	t_f	-	-	50	
Noise figure I_C = 100 µA, V_{CE} = 5 V, f = 1 kHz, Δf = 200 Hz, R_S = 1 kΩ	F	-	-	5	dB

Test circuits

Delay and rise time

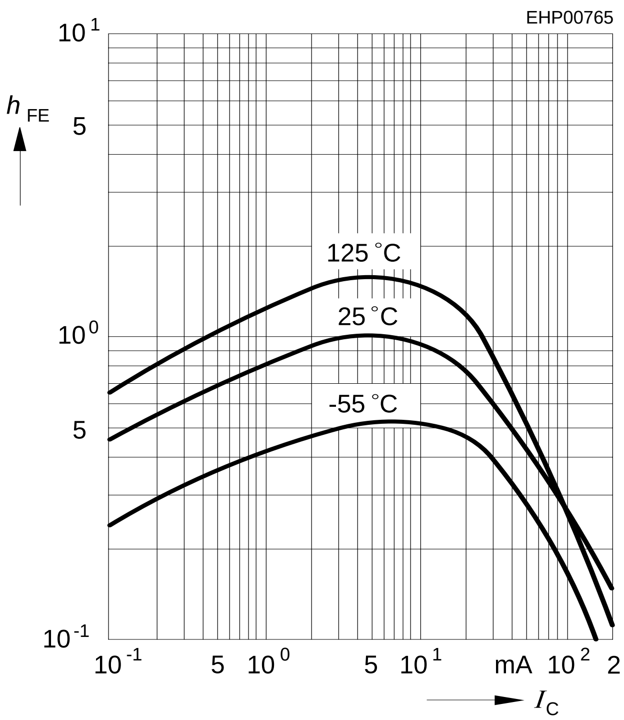


Storage and fall time



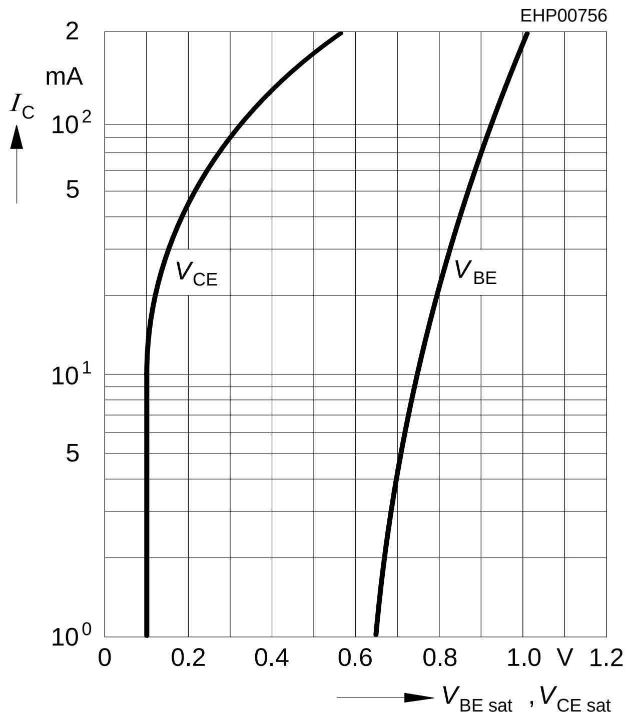
DC current gain $h_{FE} = f(I_C)$

V_{CE} = 10 V, normalized



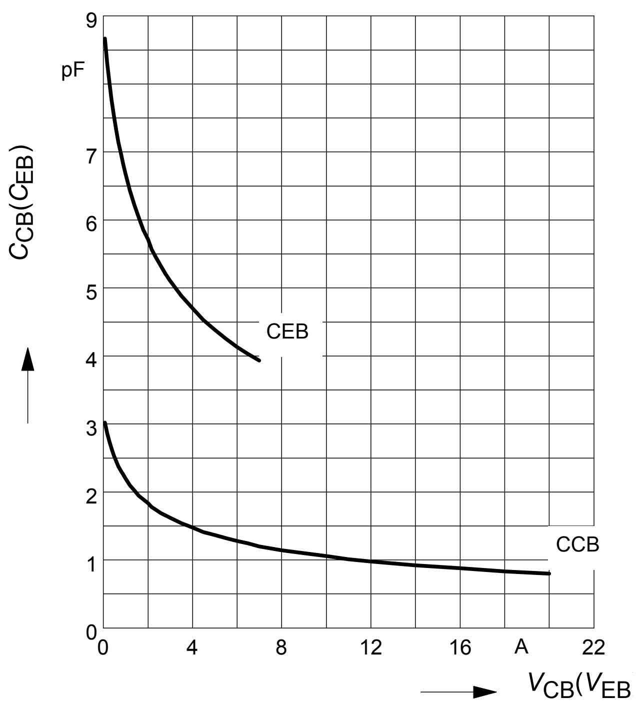
Saturation voltage $I_C = f(V_{BEsat};\ V_{CEsat})$

h_{FE} = 10



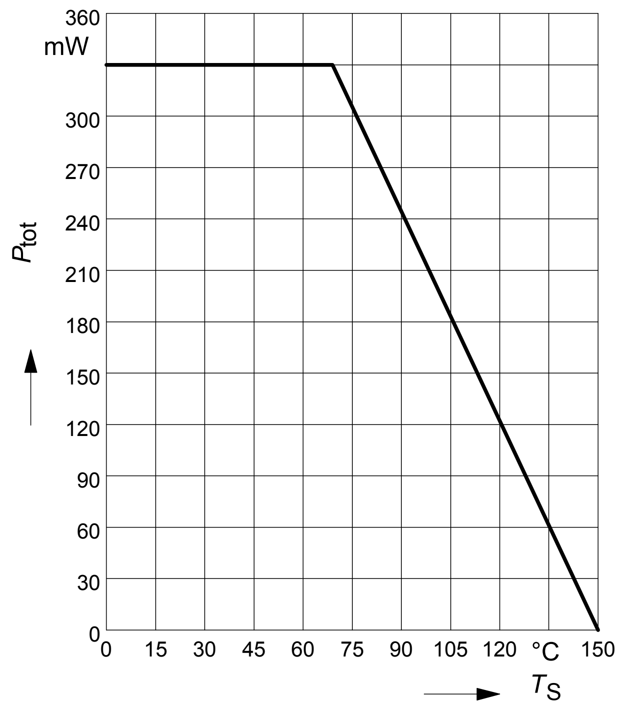
Collector-base capacitance $C_{cb} = f(V_{CB})$

Emitter-base capacitance $C_{eb} = f(V_{EB})$



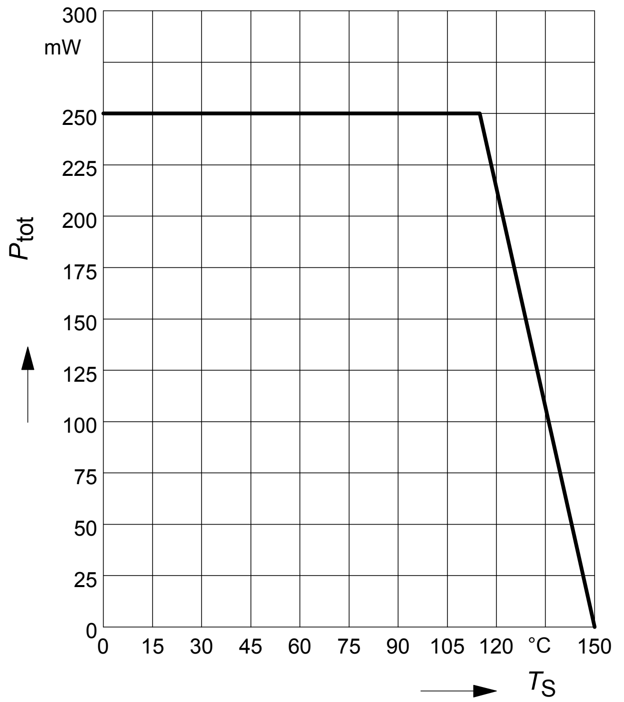
Total power dissipation $P_{tot} = f(T_S)$

SMBT3904/ MMBT3904



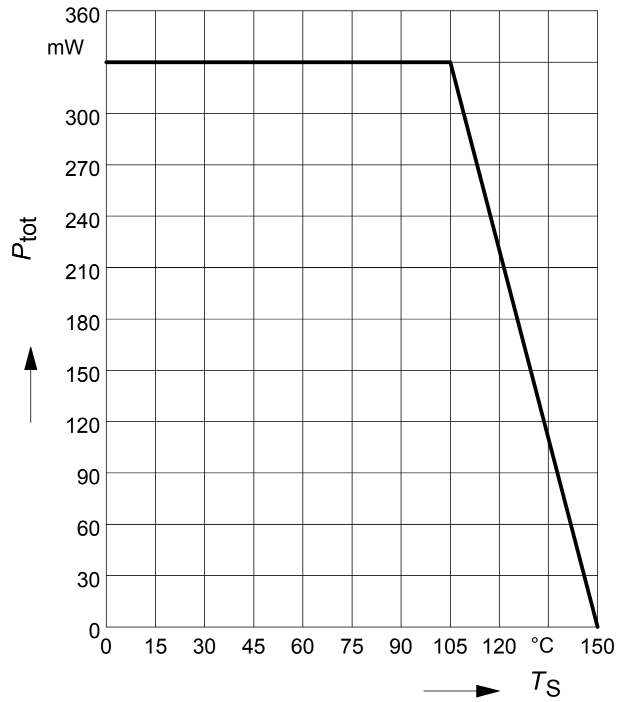
Total power dissipation $P_{tot} = f(T_S)$

SMBT3904S



Total power dissipation $P_{tot} = f(T_S)$

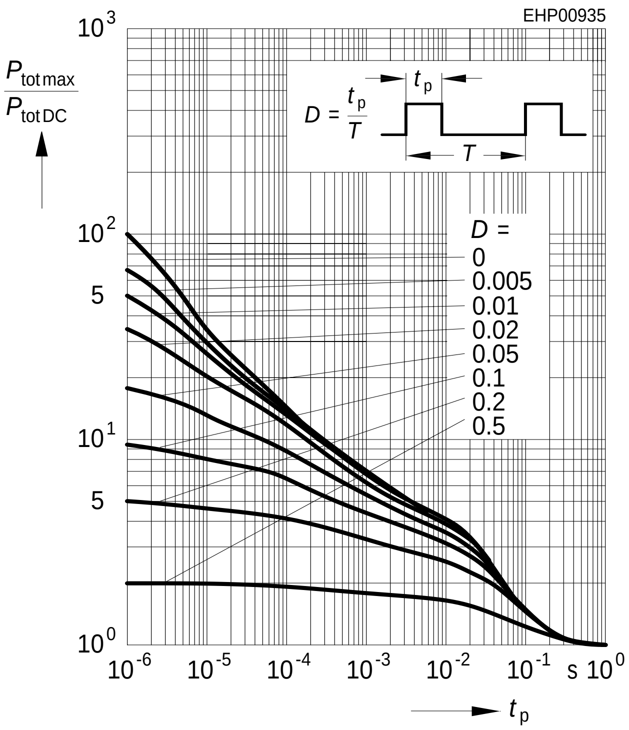
SMBT3904U



Permissible Pulse Load

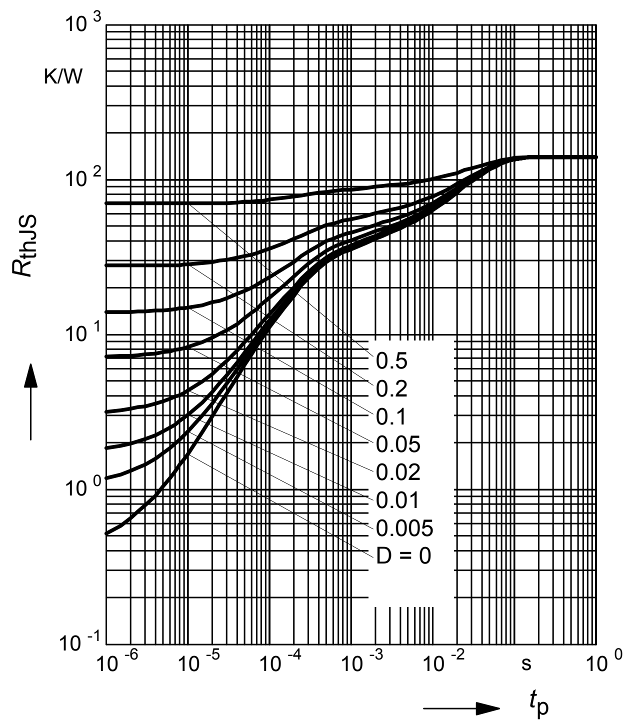
$P_{totmax}/P_{totDC} = f(t_p)$

SMBT3904/ MMBT3904



Permissible Puls Load $R_{thJS} = f\ (t_p)$

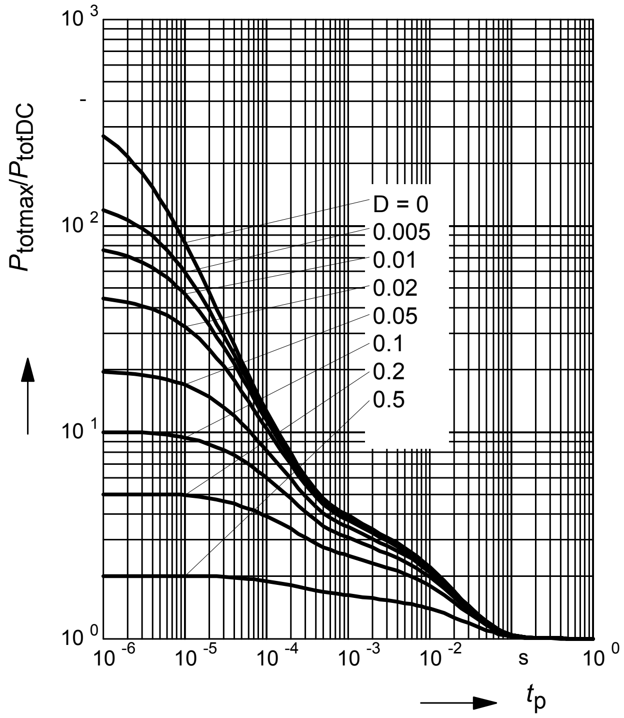
SMBT3904S



Permissible Pulse Load

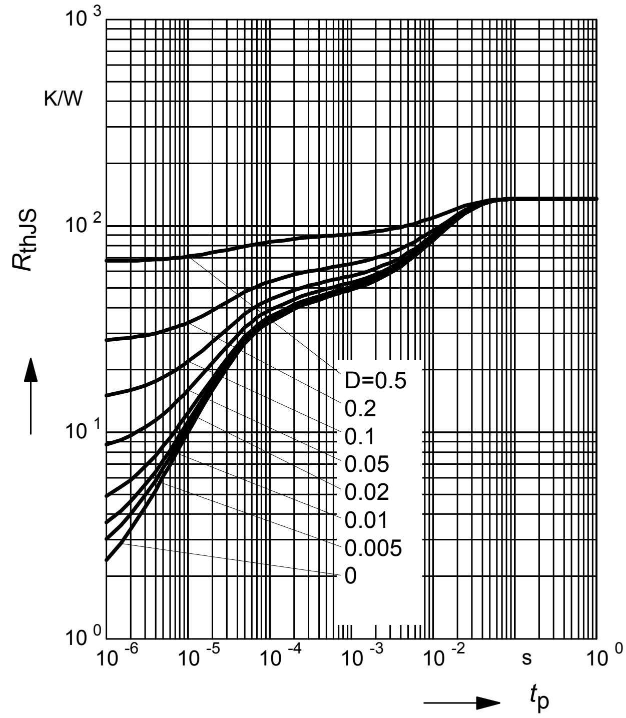
$P_{totmax}/P_{totDC} = f(t_p)$

SMBT3904S



Permissible Puls Load $R_{thJS} = f(t_p)$

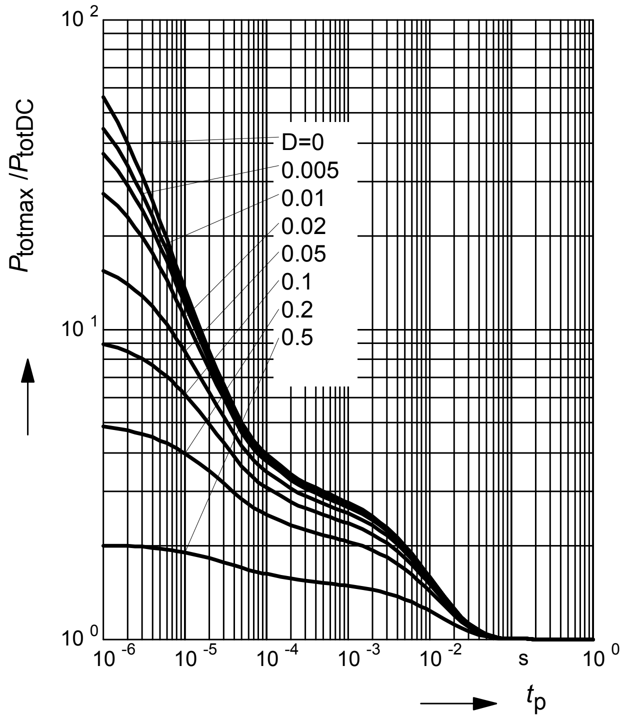
SMBT3904U



Permissible Pulse Load

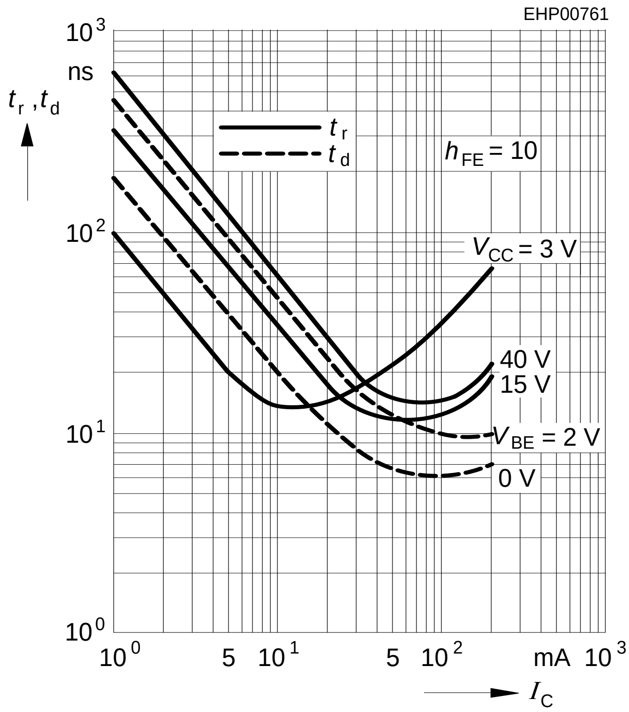
$P_{totmax}/P_{totDC} = f(t_p)$

SMBT3904U

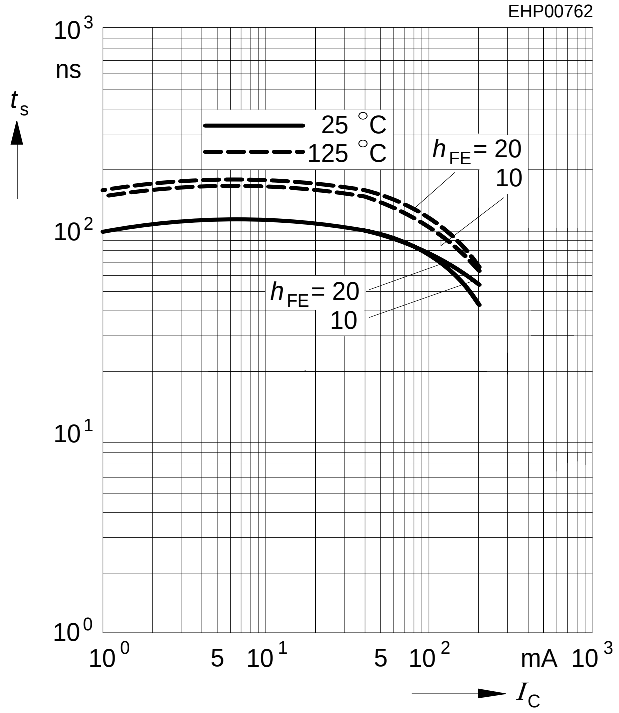


Delay time $t_d = f(I_C)$

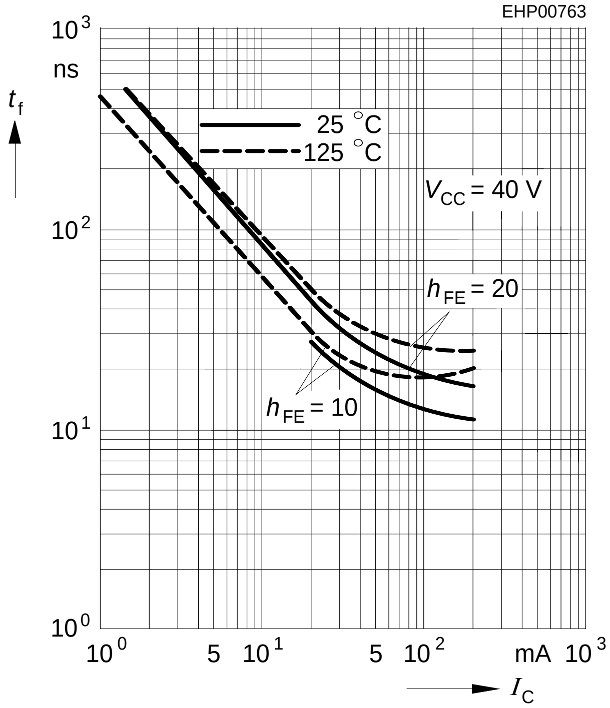
Rise time $t_r = f(I_C)$



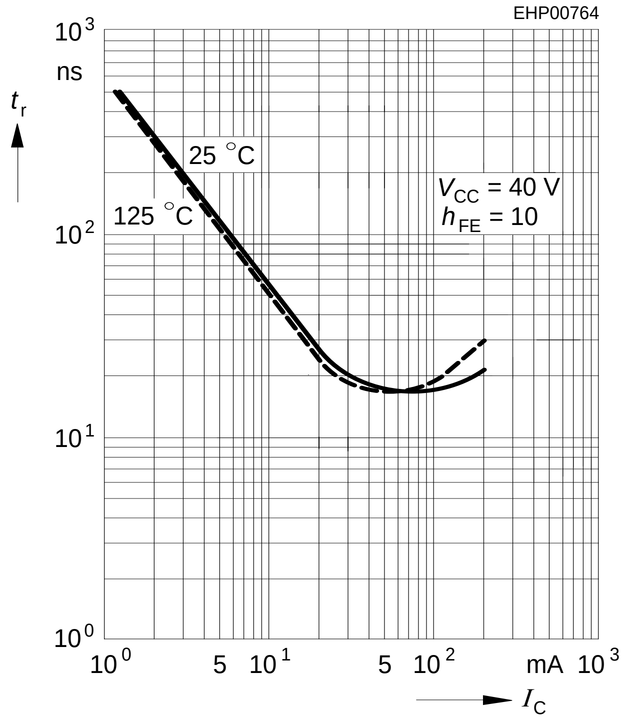
Storage time $t_{stg} = f(I_C)$



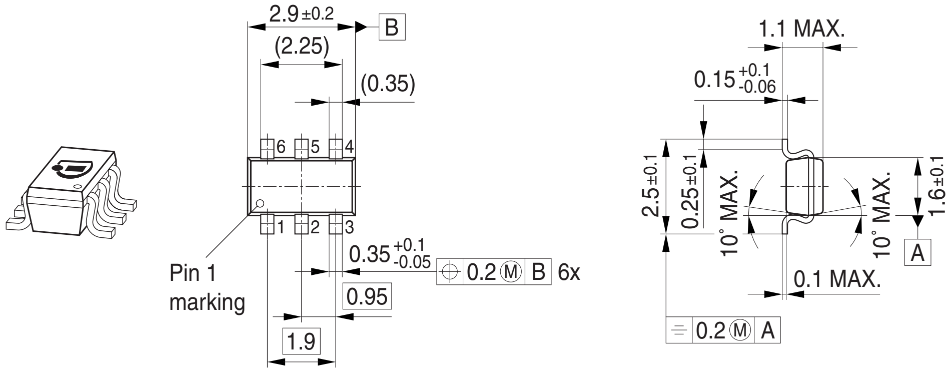
Fall time $t_f = f(I_C)$



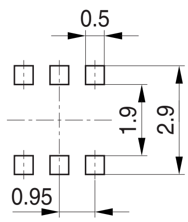
Rise time $t_r = f(I_C)$



Package Outline

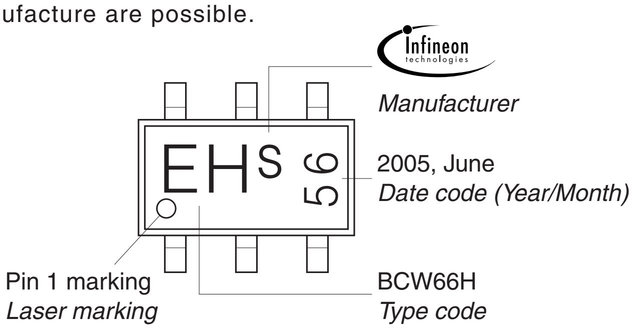


Foot Print



Marking Layout (Example)

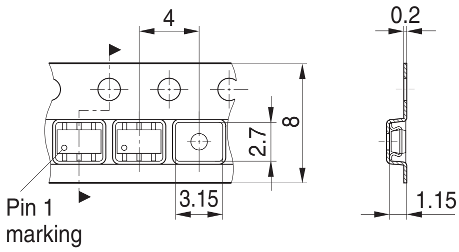
Small variations in positioning of
Date code, Type code and Manufacture are possible.



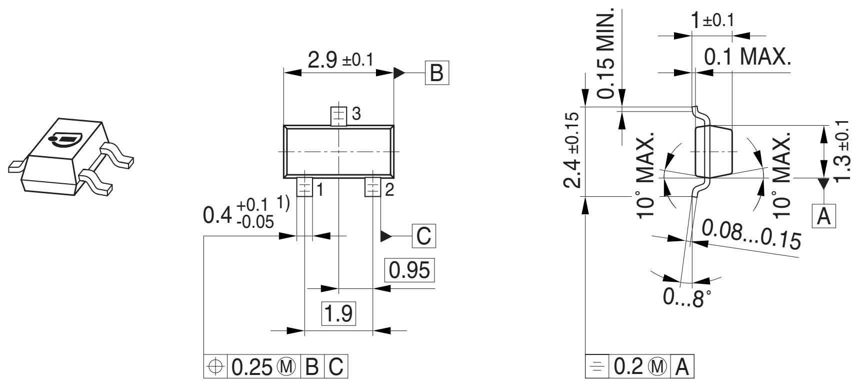
Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel
Reel ø330 mm = 10.000 Pieces/Reel

For symmetric types no defined Pin 1 orientation in reel.

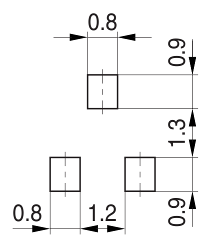


Package Outline

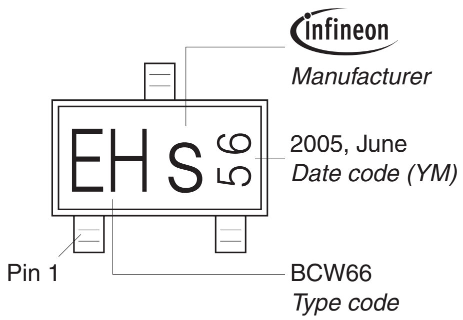


1) Lead width can be 0.6 max. in dambar area

Foot Print

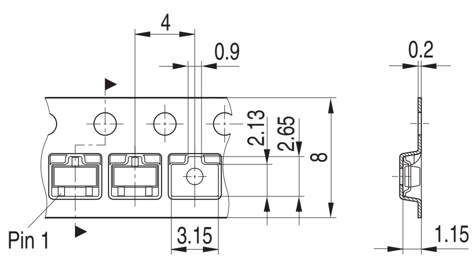


Marking Layout (Example)

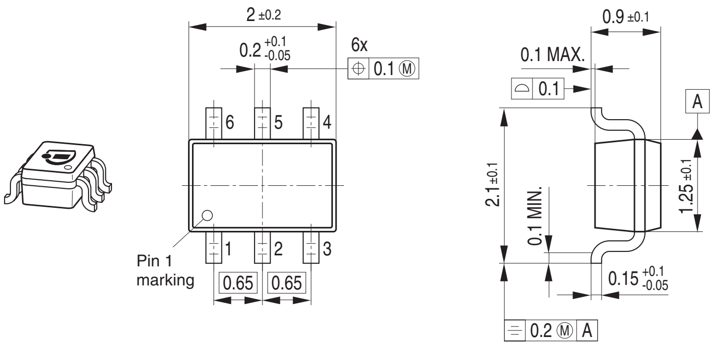


Standard Packing

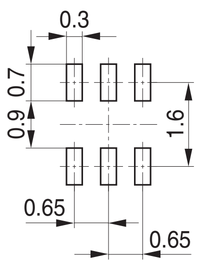
Reel ø180 mm = 3.000 Pieces/Reel
Reel ø330 mm = 10.000 Pieces/Reel



Package Outline

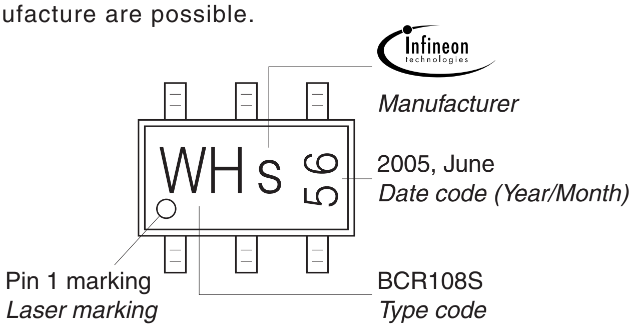


Foot Print



Marking Layout (Example)

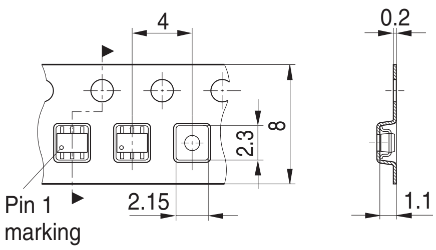
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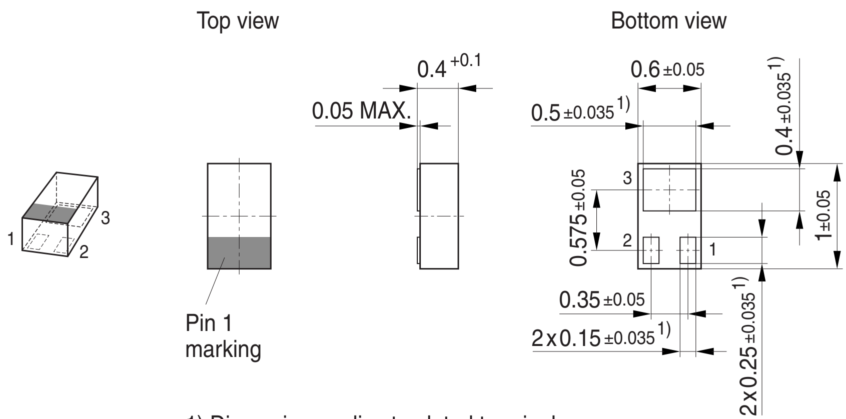
Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel
Reel ø330 mm = 10.000 Pieces/Reel

For symmetric types no defined Pin 1 orientation in reel.



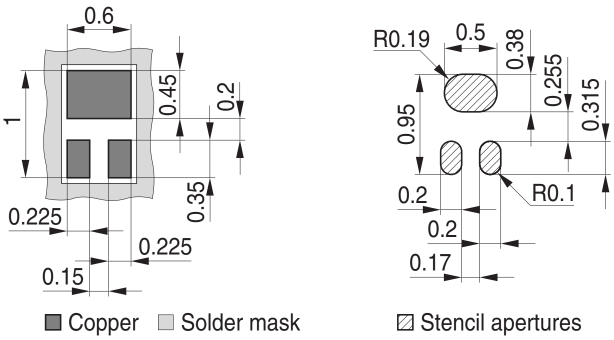
Package Outline



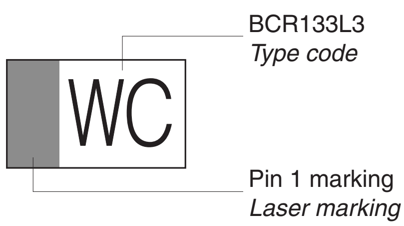
1) Dimension applies to plated terminal

Foot Print

For board assembly information please refer to Infineon website "Packages"

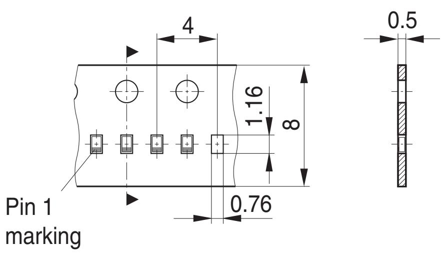


Marking Layout (Example)



Standard Packing

Reel ø180 mm = 15.000 Pieces/Reel



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